

## AIR FORCE PROGRAMS

# Advanced Extremely High Frequency (AEHF) Satellite Communications System

The Advanced Extremely High Frequency (AEHF) satellite communications system is designed to provide secure, survivable communications to U.S. warfighters during all levels of conflict. It will follow Milstar as the protected backbone of DoD's military satellite communications architecture. The first flight of the AEHF satellite program, named Pathfinder, will be programmed to operate initially as a Milstar II satellite (in lieu of an additional Milstar satellite to replace Flight 3, which placed the satellite in a non-operational orbit). The second flight will then be launched as a fully capable AEHF satellite. After it is operational, Pathfinder will be reprogrammed on-orbit as an AEHF satellite.

The first three program phases: AEHF Technology, Engineering Models, and System Definition have been completed. At Milestone B, the Defense Acquisition Board authorized fabrication and assembly of the first two satellites (SV1, SV2), development and deployment of the ground command and control segment, and advanced procurement for three additional satellites (SV3, SV4, and SV5) within the Future Years Defense Program. A separate tailored Milestone C was anticipated, following completion of the system-level Critical Design Review (CDR), to provide final authorization for production of SV3, SV4, and SV5. However, a February 2003-approved Acquisition Program Baseline incorporates a revised strategy that deletes SV4 and SV5 with a decision point in 1QFY05 to evaluate Transformational Communications development and the need, if any, for additional AEHF satellites. The first AEHF launch is scheduled for 1QFY07 and the second launch for 2QFY08.

### TEST & EVALUATION ACTIVITY

The Air Force Operational Test and Evaluation Center (AFOTEC) performed an early operational assessment (EOA) and operational impact assessment (OIA) in support of the Milestone B decision in 4QFY01. An operational assessment (OA) will be conducted in FY04 to support the Milstar Joint Program Office CDR decision. An OA will look at progress from Production Design Review/CDR events and will also assess coverage via modeling and simulation. A second OA will be conducted in FY06 to assess readiness of the AEHF Mission Control Segment to support the first AEHF launch. An OA in FY07 will evaluate the results of the developmental test/operational test performed on the Pathfinder satellite to verify its full capability to function as a Milstar II low-data-rate/medium-data-rate satellite.

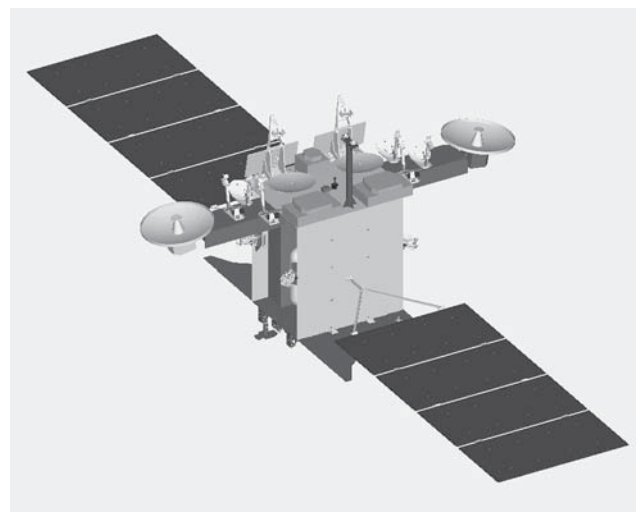
Multi-Service operational test and evaluation (MOT&E), to be conducted in FY08, will evaluate whether the entire system, including equipment, personnel, procedures, training, and logistics support, is effective and suitable based on the operational requirements.

The test will exercise satellite-to-satellite cross-links to evaluate theater-to-theater communications, network control, satellite control, and interoperability.

### TEST & EVALUATION ASSESSMENT

AFOTEC performed an EOA and OIA based on results of engineering model tests, the contractor system design review presentation, modeling and simulation, and a review of program documents. Satisfactory progress is being made by the Program Office on the four major technology risk areas: nuclear hardening and shielding, performance of the nuller spot beam, performance of the phased array antenna, and electric propulsion. DOT&E is concerned with the proposed use of turbo coding because of its susceptibility to nuclear fading.

The potential lack of terminal synchronization is a risk to successful MOT&E. In addition, AFOTEC – the lead operational test agency – identified the following risks to the test program: pressure to reduce the minimum developmental testing as defined in the September 2001



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Test and Evaluation Master Plan, insufficient software testing, the need for a payload simulator that is common to all of the terminal development programs, and availability of Pathfinder for MOT&E after it has become an operational asset. Monitoring the fidelity of the AUST-T terminal simulator and the payload simulators is imperative. If their configurations do not remain standardized and consistent with the true payload, the new terminals will not be compatible with the payload or with each other. Also, modeling and simulation will be used for both developmental and operational testing to assess nuller spot beam performance in a variety of single and multiple jammer scenarios. However, contractor model validation testing will be limited to only single jammer cases. DOT&E is concerned that the contractor needs more robust validation testing to reduce risk associated with using this model to evaluate nuller operational performance.

In addition to those items identified by AFOTEC, the program manager identified a high program risk associated with the development of the cryptographic capability to support the AEHF data rate. This includes the manufacture of a highly complex Application Specific Integrated Circuit (ASIC). To reduce the probability of a first-pass manufacturing failure of this ASIC, the foundry process is being initially exercised by the manufacturer with a test chip that represents 90 percent of the final ASIC design. Although the program remains on schedule for a December 2006 launch, schedule slips in cryptographic development have consumed the entire available margin.